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- Choice between: Excel Power Pivot & Power BI Desktop

#### **Excel Power Pivot:**

1. Power Query, Columnar Database, Relationships, DAX Formulas are almost identical in both.
2. Familiar with Excel.
3. PivotTable Report is what you want.
4. Can Publish Excel Files, but harder to share on any device.
5. No DAX Table functions in Excel Power Pivot.
6. DAX Formula calculate more slowly in Excel because they are calculated with MDX, which uses only one processor at a time.

#### **Power BI Desktop:**

1. Power Query, Columnar Database, Relationships, DAX Formulas are almost identical in both.
2. More varied Visualizations and Reports
3. Visualizations and Reports are interactive (one can filter the other)
4. You can publish Visualizations and Reports, so they can be consumed on any device.
5. Table DAX Formulas can be part of the Data Model as a Table.
6. DAX Formulas calculate more quickly in Power BI because they are calculated using DAX which allows parallel processors to work on calculations. This matters for big data.

#### **I switch from Excel Power Pivot to Power BI Desktop when:**

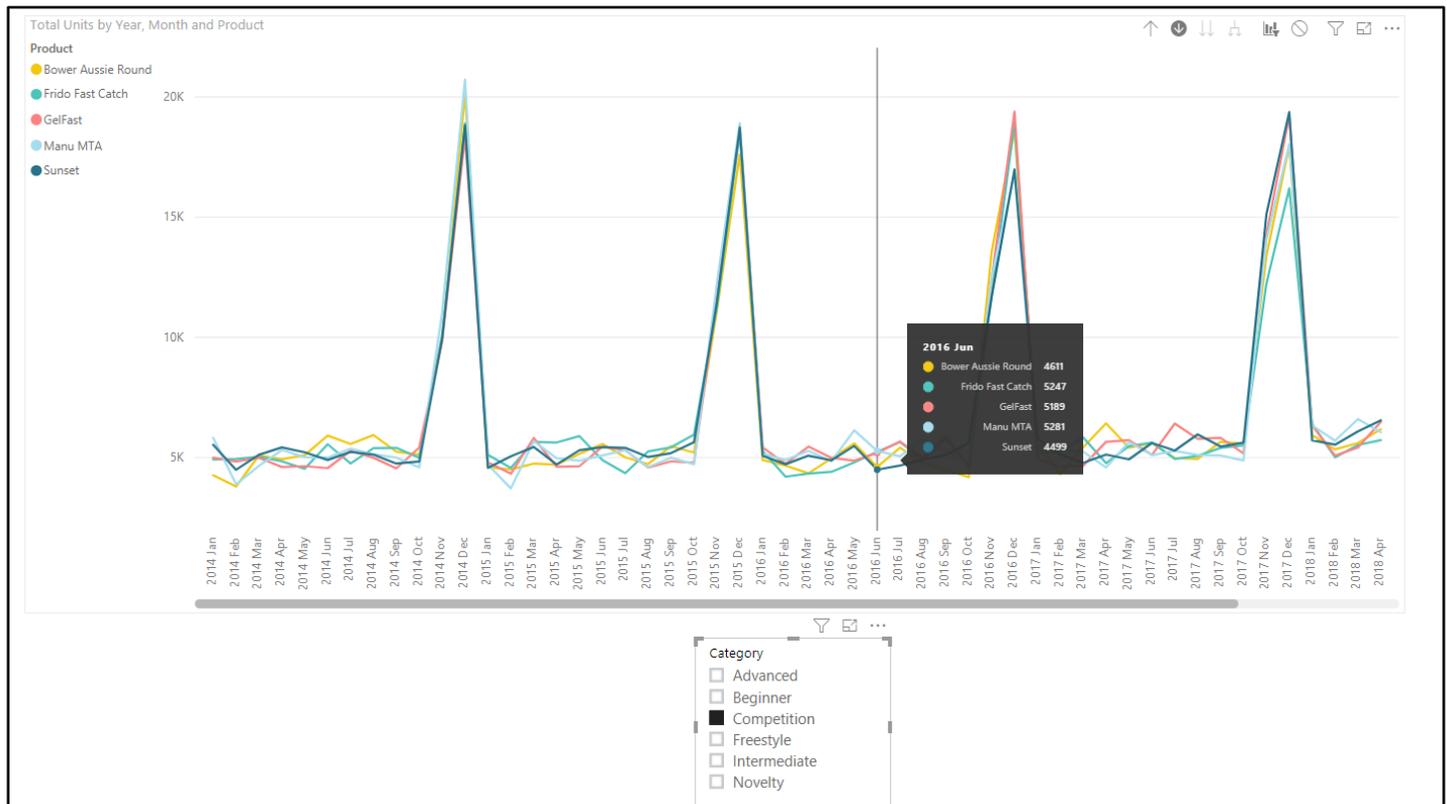
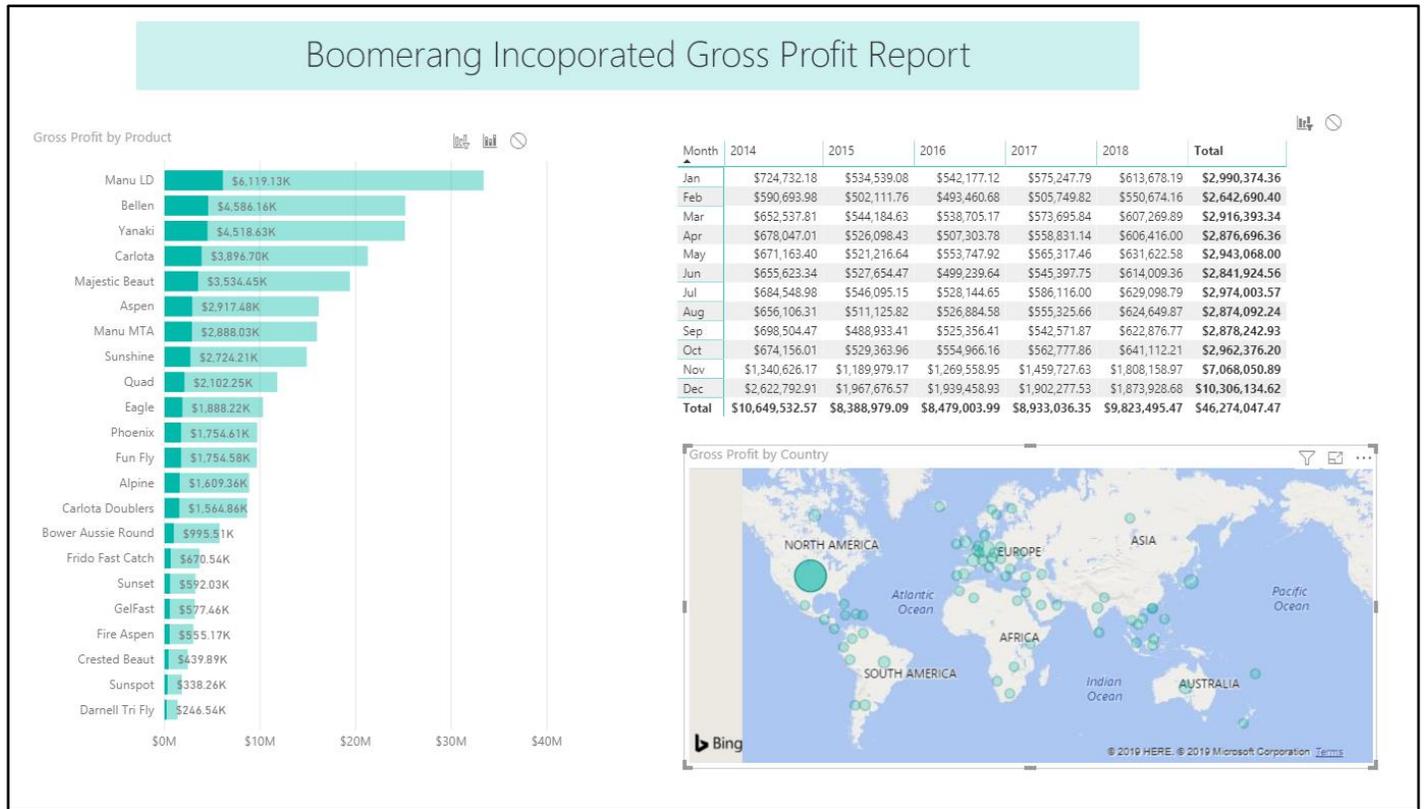
1. Want the Visualizations in Power BI, rather than a PivotTable
2. Want interactivity between visualizations and Reports
3. I have too much data and I need faster calculation times in Power BI

- **Approximate History of Power BI Desktop :**
  - i. Power Pivot with the Columnar Database, DAX Formulas, Relationships and Data Model PivotTables were debuted as an add-in to Excel in 2009
  - ii. Power Query was debuted as an Add-in for Excel in 2013
  - iii. Power View & Power Map were add-ins in Excel also
  - iv. All these Power Tools were refined in Excel between 2009 and 2015.
  - v. Then in 2015 Microsoft combined all these tools together in one tool and gave it away for free. This tool was called Power BI Desktop.
- **Power BI Desktop is a free download that accomplished these goals:**
  - i. We can import, transform and clean data and load it to the Power BI Desktop Data Model.
  - ii. We can build relationships between tables.
  - iii. We can build DAX Measures, DAX Calculated Columns and DAX Tables for the Data Model.
  - iv. There are tabs in our Power BI File and each tab contains a set of tables, visualizations, formatting, filters and other visual elements that together are a single Tab or Page.
  - v. All of the Tabs (Pages) together are called the report.
  - vi. The report can be published to powerbi.com.
  - vii. From the published report at powerbi.com, we can:
    1. View and interact with the report on any device.
    2. Print parts of our report.
    3. Download “.pbix” file.
    4. Get embed code to use in a web site.
    5. Export as a PowerPoint Slide Show.
    6. Share with others who have an e-mail.
    7. Pin Multiple Tabs from multiple Reports to an online Power BI Dashboard.

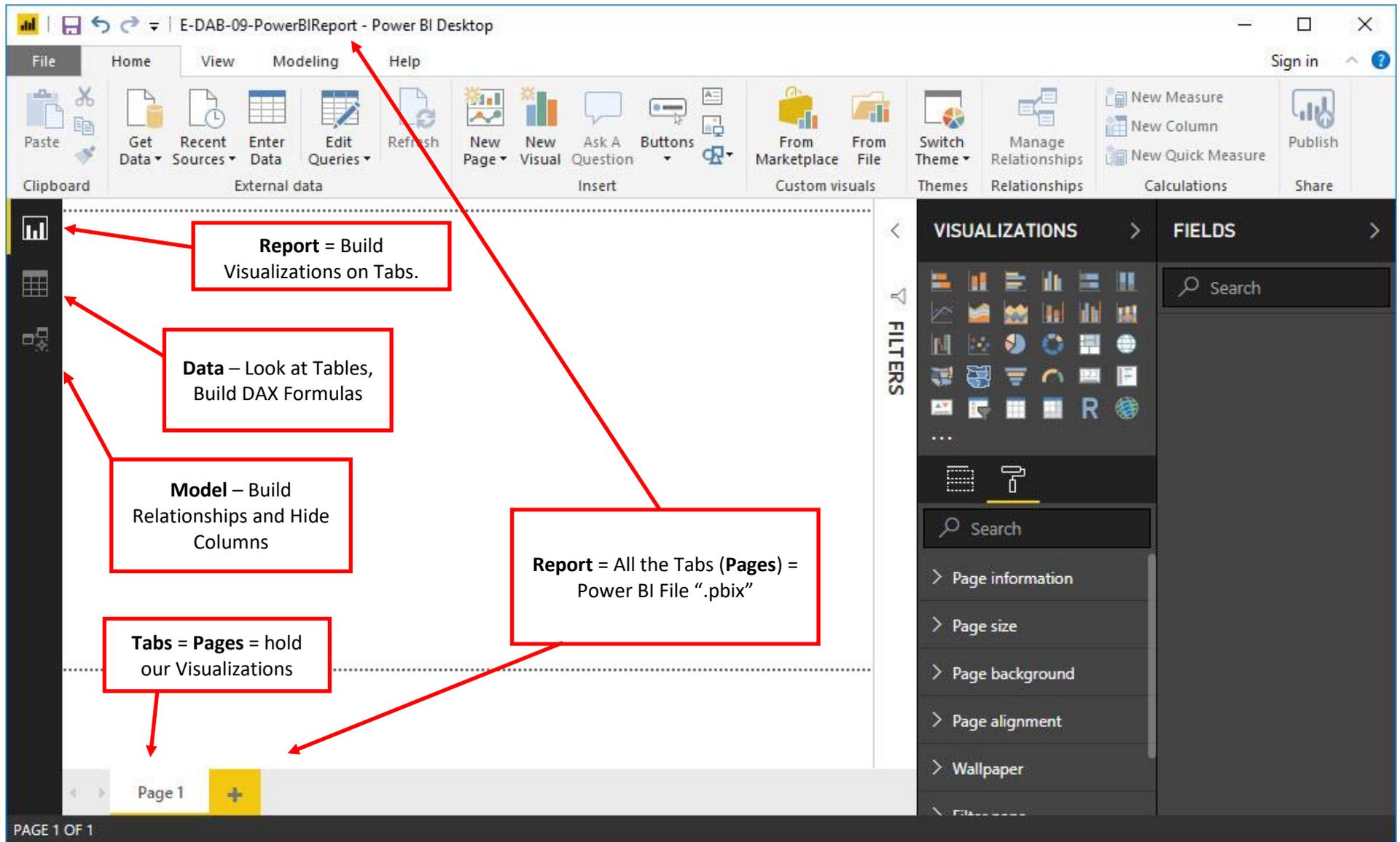
- Different Versions of Power BI (Different Power BI Products) Available from Microsoft :
  - 1) Microsoft web site link for Power BI Products:
    - <https://powerbi.microsoft.com/en-us/pricing/>
  - 2) Versions of Power BI (Different Power BI Products):
    - i. Power BI Desktop
      1. Price: Free
      2. Connect to hundreds of data sources
      3. Clean and prepare data using visual tools
      4. Analyze and build reports with custom visualizations
      5. **Publish to the powerbi.com**
      6. **Can share “.pbix” file so others with the “free” Power BI Desktop can view.**
      7. **Create Web Embed Code you can post at Public web site.**
    - ii. Power BI Pro
      1. \$9.99, per user, per month
      2. Build dashboards that deliver a 360-degree, real-time view of the business
      3. Keep data up-to-date automatically, including on-premises sources
      4. Collaborate on shared data
      5. Audit and govern how data is accessed and used
      6. Package content and distribute to users with apps
      7. **Publish to powerbi.com and have others view on any device.**
      8. From published report viewers can download Data Model into Excel or as a “.pbix” file. (Implicit Measures will not download into an Excel file).
    - iii. Power BI Premium
      1. Price: Negotiated per node, per month
      2. Share data with users inside and outside your organization without purchasing a per-user license
      3. Allocate, control, and manage your dedicated server capacity
      4. Unlock higher limits for Pro users with datasets up to 10 GB and refresh up to 48 times per day
      5. Access interactive and paginated reports online or use **Power BI Report Server for on-premises reporting**
      6. Deploy in the geographic region of your choice
- Download Power BI Desktop :
  - i. Microsoft Download Page: <https://www.microsoft.com/en-us/download/details.aspx?id=45331>
    1. When you want to update each month, you have to re-download and re-install.
  - ii. Microsoft Windows Store: <https://powerbi.microsoft.com/en-us/desktop/>
    1. This download will automatically update each month.

- List of Charts and Visualizations for your Dashboard (Review from E\_DAB Video #05) :
  - i. What do Visualizations do?
    1. Visually portray quantitative data (number data).
    2. Give a **quick impression** of the number data.
    3. Create a picture that can communicate more quickly than just the numbers alone.
    4. Allow you to see **patterns or trends** that you may not be able to see looking at just numbers.
    5. Allows you to make relative comparisons more quickly than if you are using a table
  - ii. Types of Visualizations:
    1. **Tables**: Field Names in First Row and Records in Rows. Use when you want to see the individual numbers rather than a quick visual impression.
    2. **Matrix**: Cross Tabulated Table with Row and Column Criteria and an intersecting calculation based on Row and Column Criteria.
    3. **Column**: Use to compare differences across categories. Height of column conveys number.
    4. **Bar**: Use to compare differences across categories. Length of bar conveys number.
    5. **Stacked Column/Bar**: Good for displaying crosstabulation, emphasis on horizontal axis categories.
    6. **Clustered Column/Bar**: Good for displaying crosstabulation, emphasis on legend categories.
    7. **Histogram**: Chart used for counting numbers between a lower and upper limit. No gap between column indicates that there are no numbers between the upper and lower limit.
    8. **Line**: Use to show trend for a number variable over a category such as time.
    9. **Combination Chart**: Combine different chart types such as Column and Line.
    10. **X-Y Scatter**: Used to show relationship between two number variables (x and y variables).
    11. **Break Even Chart**: Specific type of X-Y Scatter Chart that shows the break-even cross over lines for Revenue and Costs.
    12. **Bubble Chart**: Method of visualizing 3 variables in a 2-dimensional chart.
    13. **Cards** : Text box that can display Measures
    14. **Maps**: Used for geographic data, like sales by zip code, states, or country.

- Visualization Goals for Video:



- Power BI Desktop Window:

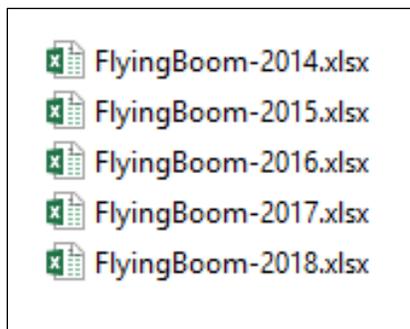


- **Steps to Data Modeling with Power BI Desktop:**

- 1) Import Tables into Power BI Desktop. Create dCalendar Table with DAX Table function.
- 2) Create Relationships between Dimension & Fact Tables.
- 3) Create DAX formulas: Calculated Columns & Measures.
- 4) Hide Tables and Fields that are not used in Reports and Visualizations.
- 5) Create Reports and Visualizations.
- 6) Refresh Data Model when source data changes.
- 7) Edit Data Model as necessary.

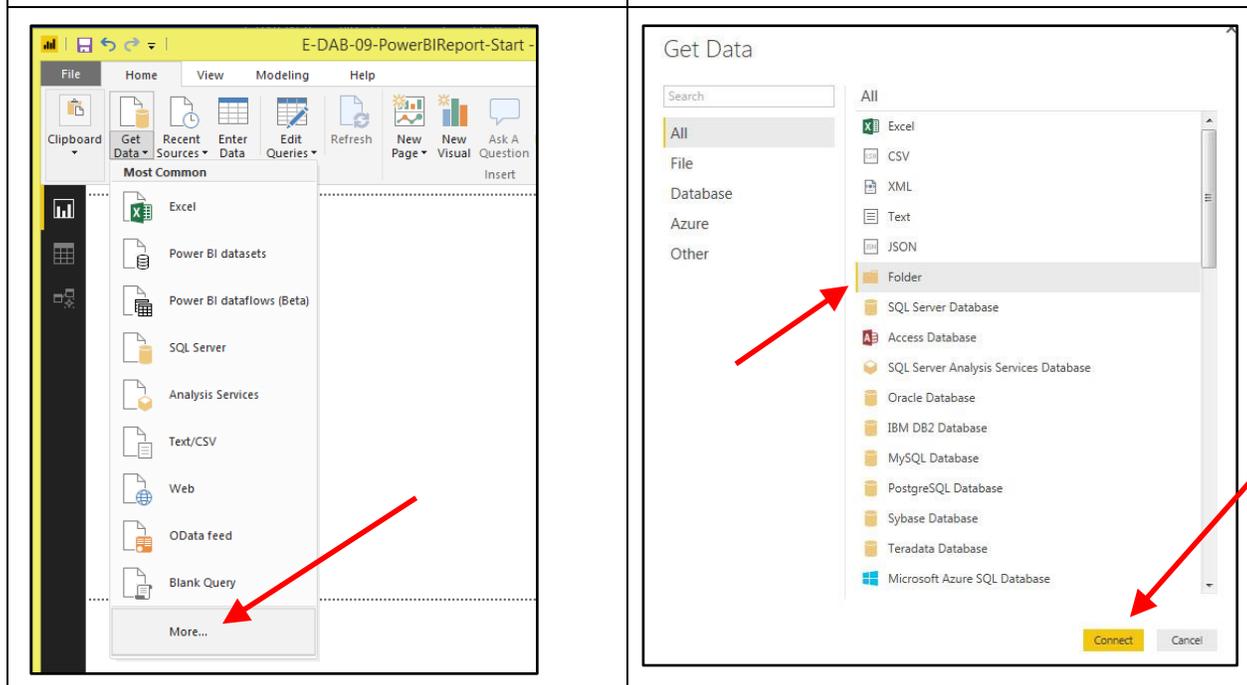
- **Data Model Step 1: Import Data into Power BI Desktop**

- 1) Download Power BI Desktop
- 2) Open Power BI Desktop
- 3) Save As and name your file. We called our file “E-DAB-09-PowerBIReport-Start.pbix”.
- 4) After you download the zipped folder named “E-DAB-09-PowerBISourceZippedExcelTables”, and then unzip it, you will see we have five different Excel files that we need to import from a Folder. Each Excel File has one Sheet with a Proper Data Set with Sales Records. A list of the Excel files are seen here:

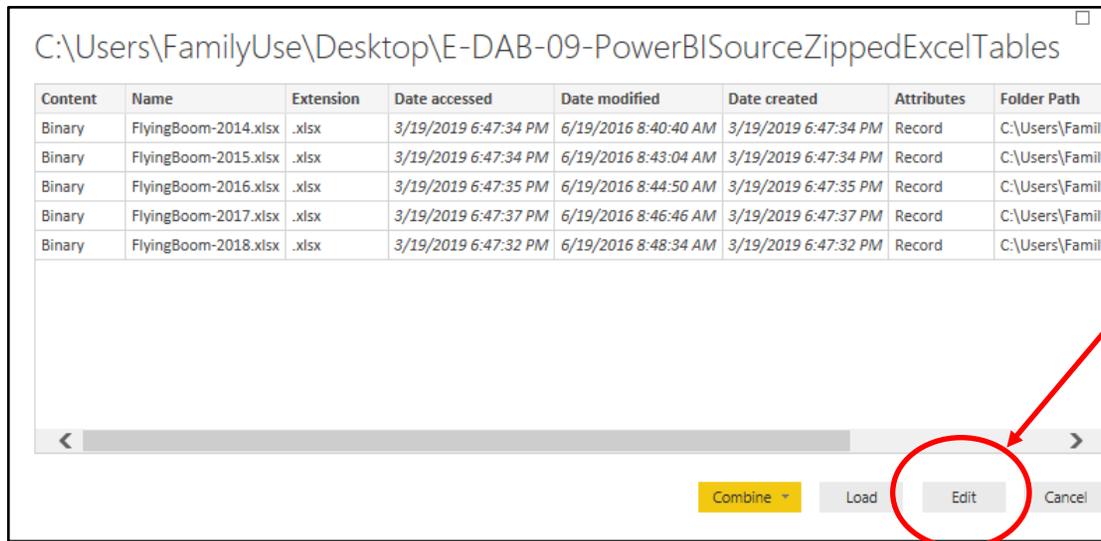


5) In the Power BI Desktop Home Ribbon Tab, in the External Data group (Power Query), click on the Get Data drop-down, then click on More.

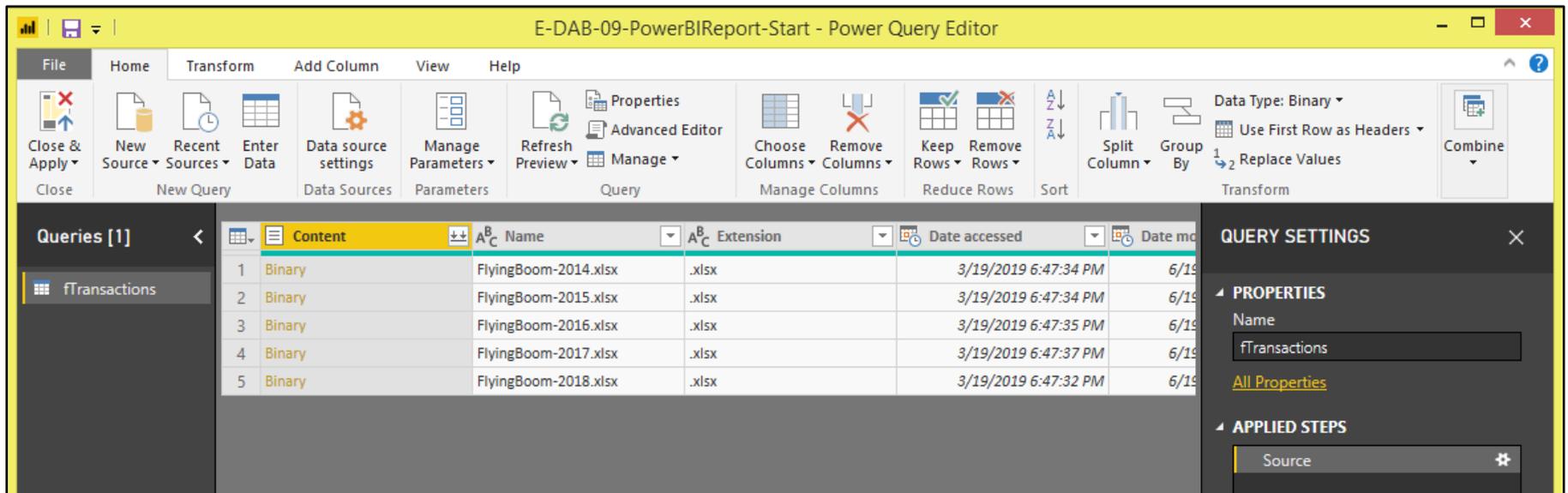
6) Then click on Folder. Then click on Connect.



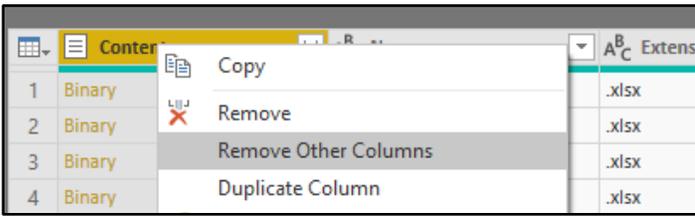
- 7) After you click on Content, navigate to the folder path “E-DAB-09-PowerBISourceZippedExcelTables”. Click OK.
- 8) In the next dialog box, click Edit, as seen here:



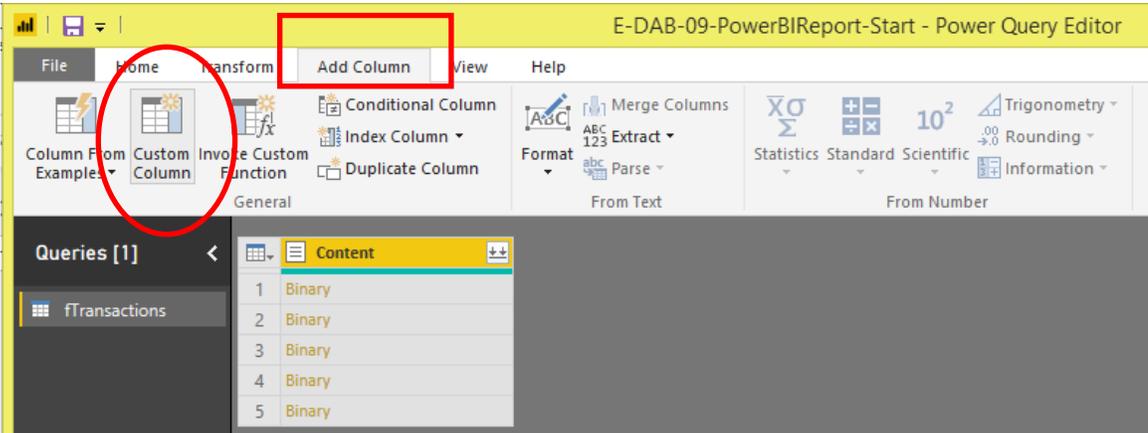
- 9) The Power Query Editor in Power BI Desktop looks almost identical to the Power Query Editor window in Excel, as seen below.
- 10) Because we imported from a folder, the Power Query Editor lists the files in the Content column and attributes about the files in subsequent columns.
- 11) Name the Query “fTransactions”:



12) Right-click the Content Column and click on Remove Other Columns, as seen here:



13) Because Excel files can have many objects in one file (like Sheet objects, Table objects, Defined Names objects and so on) we cannot click the combine button (like we did in E-Dab Video #6 when we combined/appended Text Files). Instead, we have to add a Custom Column and use the Excel.Workbook function to extract the objects in the Excel File. The Custom Column button is in the Add Column Ribbon Tab in the Power Query Editor, as seen here:

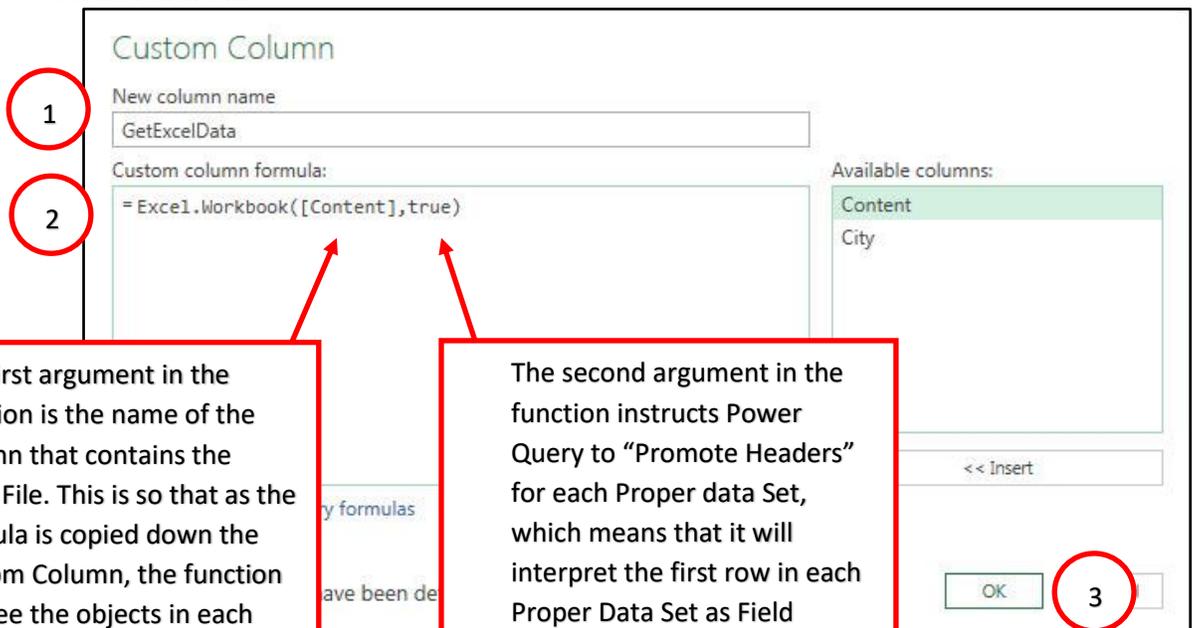


14) Then in the Custom Column dialog box:

1. In the New column name textbox, type the name: "GetExcelObjects".
2. In the Custom column formula textbox, type the formula:

**= Excel.Workbook([Content],true)**

3. Then click OK.



15) The result of the Custom Column is seen below.

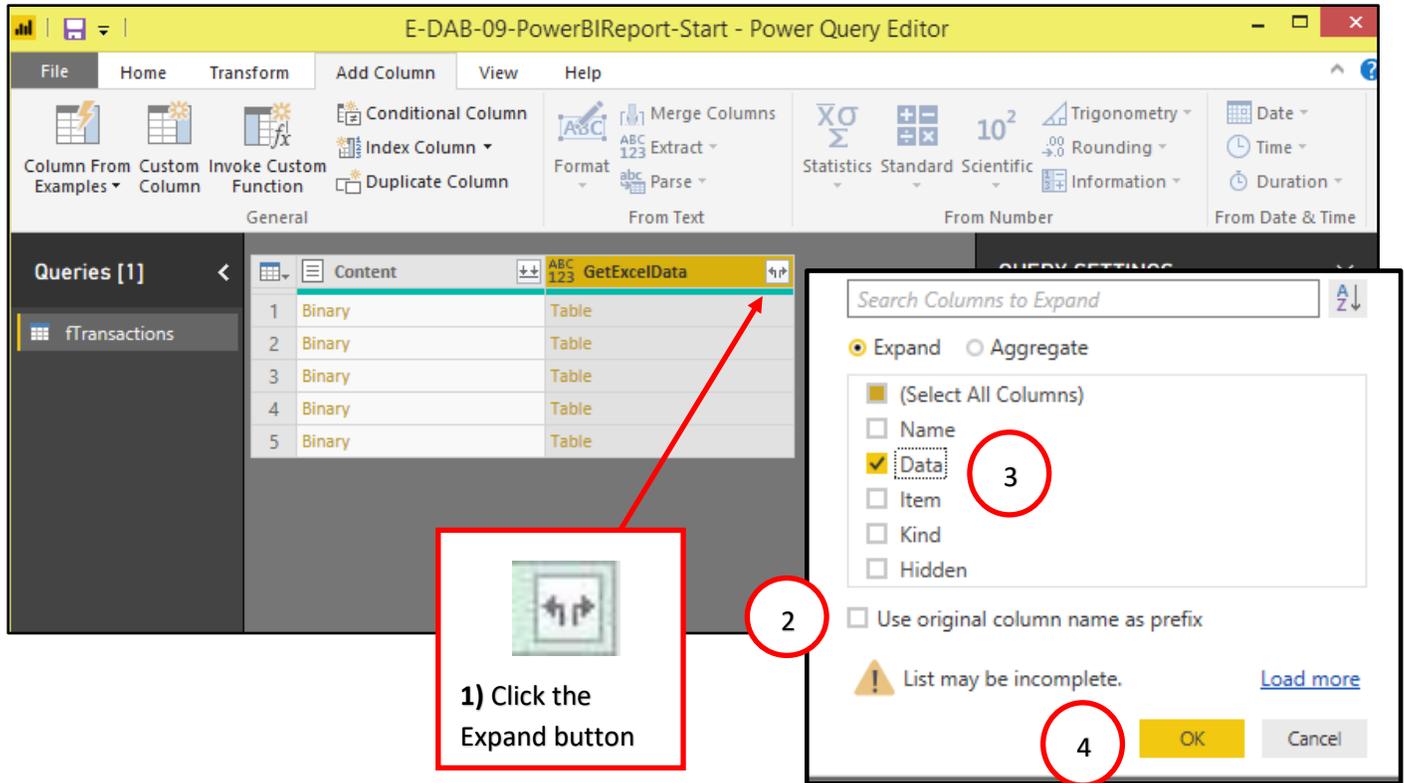
1. The Custom Column named "GetExcelData" delivers a table for each row that gives us information about what kind of objects are in each Excel File.
2. If you click to the right of the word "Table" in the first cell of the GetExcelData column, you can see a table appear in the lower part of the query.
3. The table in the lower part of the query has five columns that give us information about what type of objects are in the Excel File. For example, in the "Kind" column tells us what kind of object it is. Since each Excel Workbook File that we are importing has only one Worksheet, we can see the name "Sheet" in that column. In the Name column we can see the name of that Sheet object, in the below picture the name "2015" appears.

The screenshot shows the Power Query Editor interface. The main area displays a table with the following data:

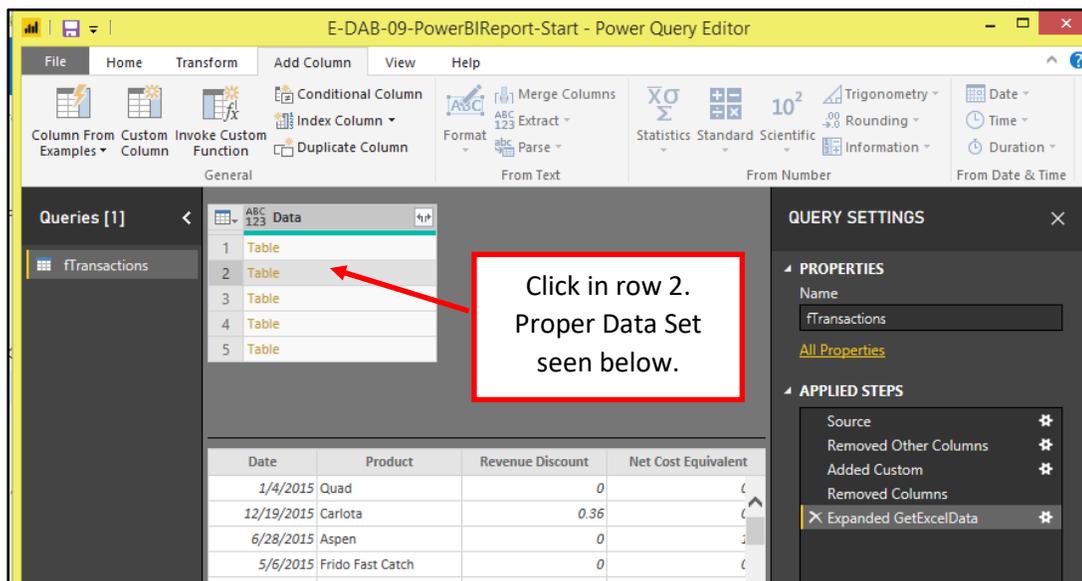
	Name	Data	Item	Kind	Hidden
1	Binary	Table	2015	Sheet	FALSE
2	Binary	Table			
3	Binary	Table			
4	Binary	Table			
5	Binary	Table			

The 'Name' column contains the value '2015', the 'Data' column contains 'Table', the 'Item' column contains '2015', the 'Kind' column contains 'Sheet', and the 'Hidden' column contains 'FALSE'. A red circle labeled '1' highlights the column header 'GetExcelData'. A red circle labeled '2' highlights the 'Table' cell in the first row, with a red arrow pointing to the expanded table below. A red circle labeled '3' highlights the 'Name' column header in the expanded table.

- 16) The next step is to remove the Content column, so we right-click the Content column and click on Remove.
1. To expand the tables in each row and repeat the City name for each row associated with that file, Click Expand button.
  2. Uncheck "Use original column name as prefix".
  3. Uncheck all columns except for "Data". This Data Column has the Proper Data Sets from each Sheet in each Workbook File.
  4. Click OK



- 17) In the next step we are left with only the Data Column. This column contains the one Sheet object and the one Proper Data Set from each Excel Workbook File.



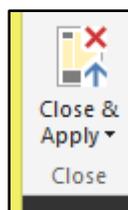
18) Now we click the Expand button to Combine or Append the Proper Data Sets into one table.

The screenshot shows the Power Query Editor interface. The 'Queries' pane on the left lists a query named 'Data'. A red arrow points from this query to the 'Expand' button in the 'Queries' pane. A red box highlights the 'Expand' button icon with the text '1) Click the Expand button'. The 'Expand' dialog box is open, showing options to 'Expand' or 'Aggregate' data. The 'Expand' option is selected, and several columns are checked: (Select All Columns), Date, Product, Revenue Discount, Net Cost Equivalent, County Code, and Units. There are 'OK' and 'Cancel' buttons at the bottom of the dialog.

19) Add Correct Data Types to each Field/Column, as seen below:

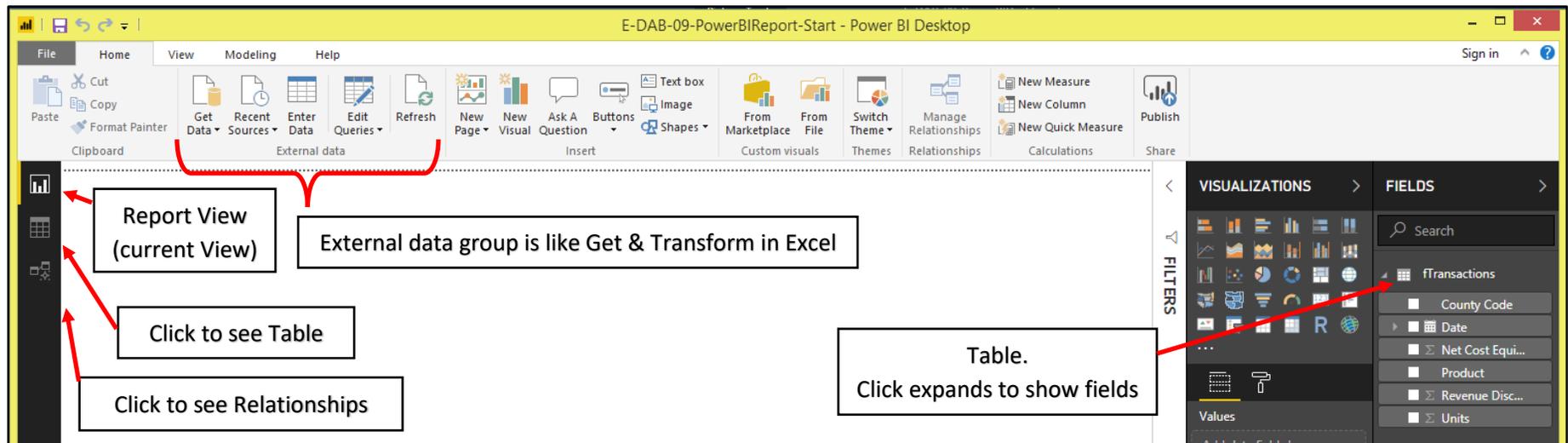
The screenshot shows the Power Query Editor interface with a data table. The columns are: Date, Product, Revenue Discount, Net Cost Equivalent, County Code, and Units. The 'Data Type' dropdown for 'Units' is set to 'Whole Number'. The 'QUERY SETTINGS' pane on the right shows the 'APPLIED STEPS' list, which includes 'Changed Type' at the bottom.

20) In the Close group in the Home Ribbon Tab in the Power Query window, click the Close and Apply button (Close = Close Power Query Editor window, Apply = apply query steps and load the Table to the Power BI Desktop Data Model's Columnar Database).

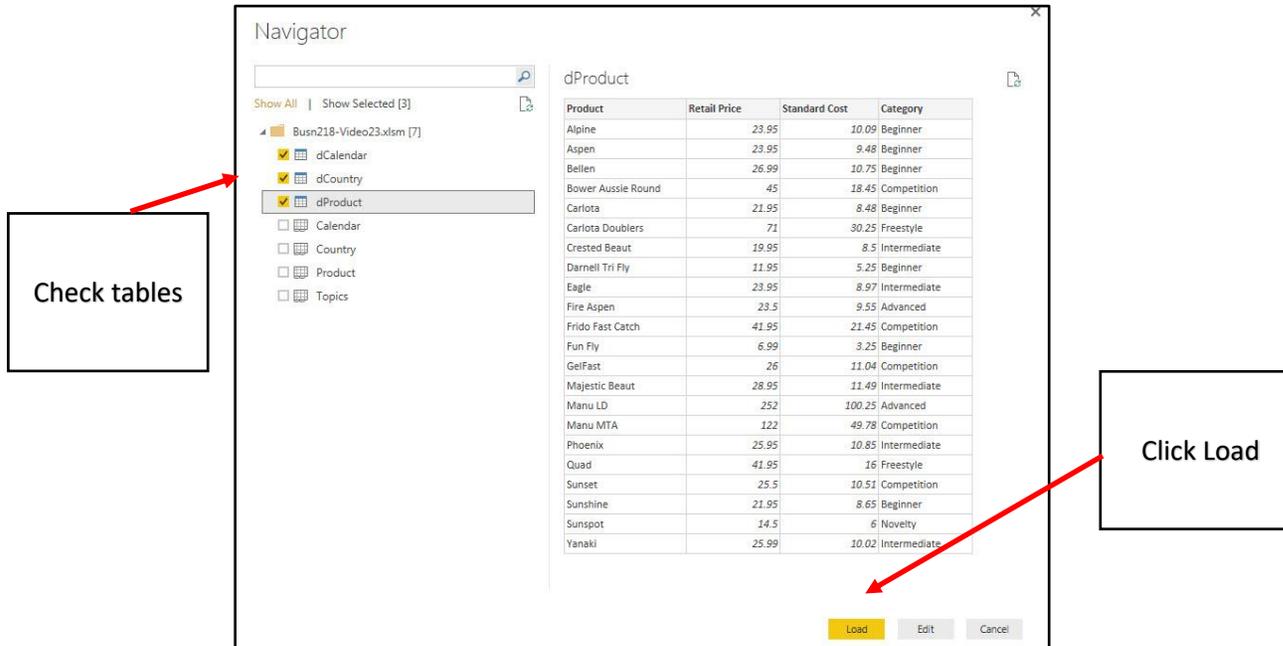


**Close** = Close Power Query Editor window  
**Apply** = apply query steps and load the Table to the Power BI Desktop Data Model's Columnar Database

21) When the query loads and you click on The Report View on the Left, the window looks like this:

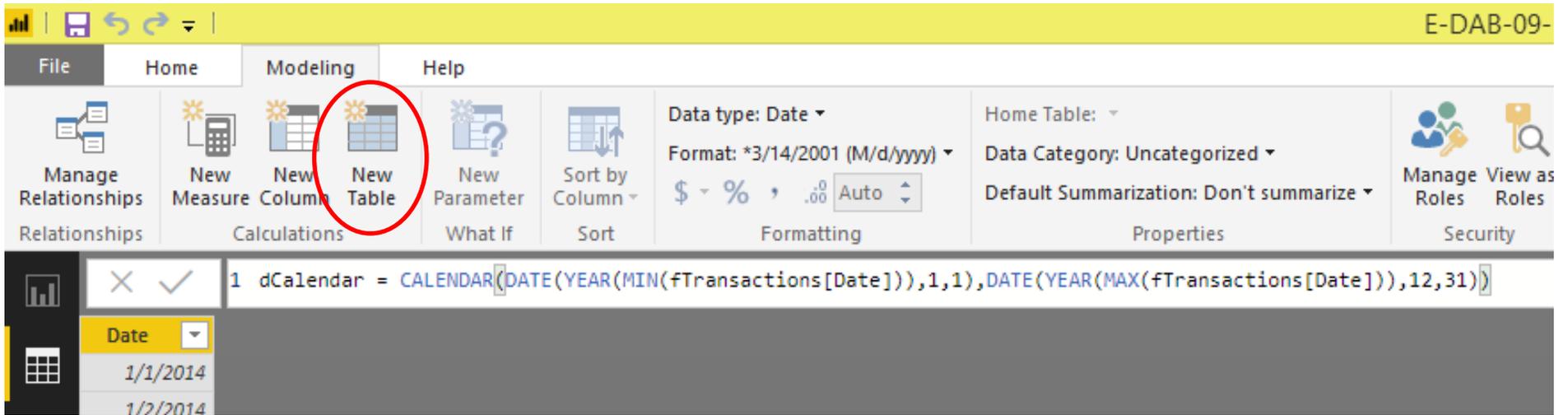


22) To import Excel tables (dProduct, dCalendar, dCountry), go to Power BI Desktop Home Ribbon Tab, in the External Data group, click on the Get Data drop-down, then click on Excel. Navigate to the file “E-DAB-09-PowerBISourceTables.xlsm”. In the Navigator window, check the checkboxes for the three dimension tables. Then click the Load button.



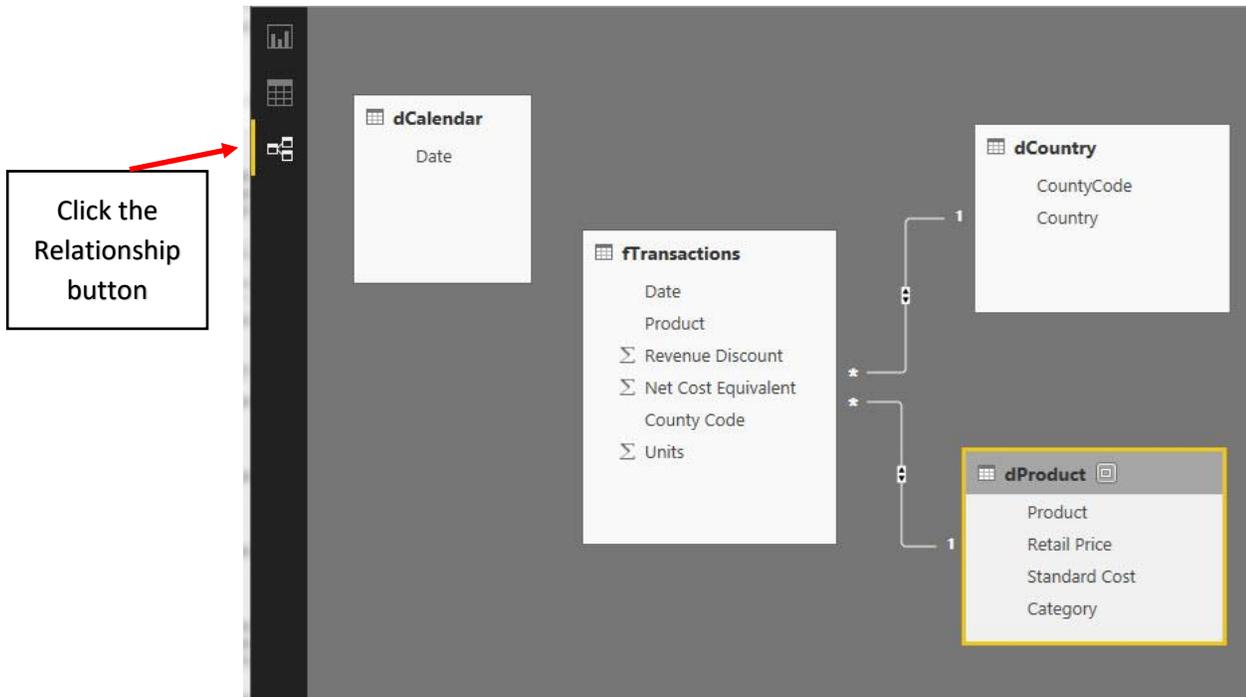
23) Create the dCalendar Table:

1. In the Modeling Ribbon Tab, click the New Table button and then create the formula as seen below:

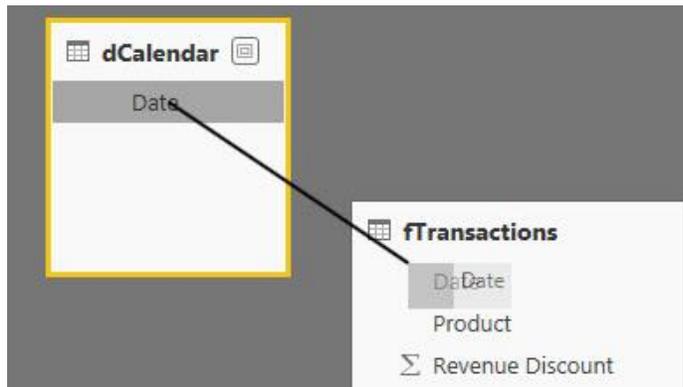


- Data Model Step 2: Create Relationships between Dimension & Fact Tables

- 1) After you import Excel Tables, click on the relationship button to see that two relationships were automatically detected and created.



- 2) For the relationship between the two Date Columns, drag Date to Date:



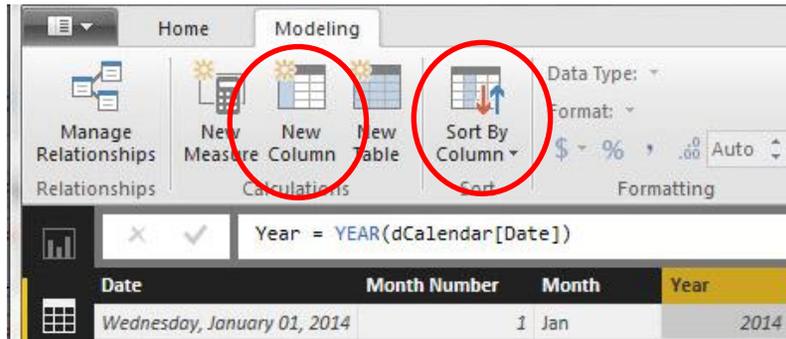
- 3) Click to see the dCalendar Table.

The screenshot shows the Power BI ribbon and Fields pane. The ribbon is set to the "Modeling" tab, and the "Fields" pane on the right shows the dCalendar table selected. A red arrow points from a text box labeled "Click to see Tables" to the relationship icon in the ribbon. Another red arrow points from a text box labeled "Click to see Date Table" to the dCalendar table in the Fields pane.

Date
Wednesday, January 01, 2014
Thursday, January 02, 2014
Friday, January 03, 2014
Saturday, January 04, 2014

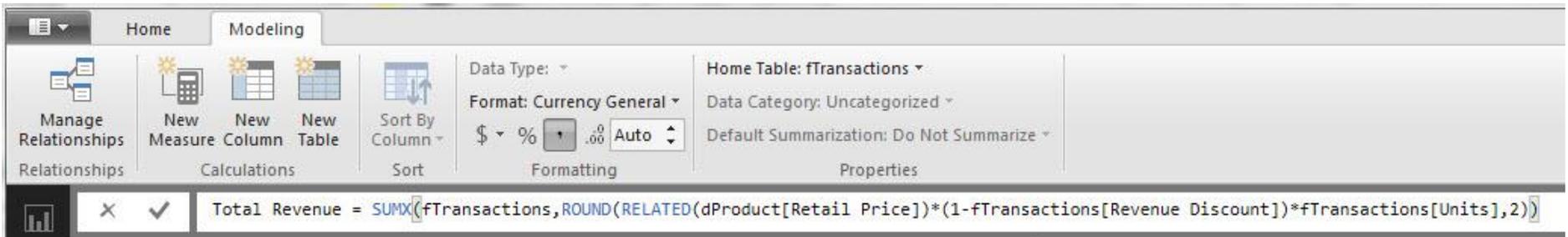
- Data Model Step 3: Create DAX formulas: Calculated Columns & Measures

- 1) From the Modeling Tab, click the New Column button and create Month Number, Month and Year Calculated Columns, like:
  1. Month Number = MONTH(dCalendar[Date])
  2. Month = FORMAT(dCalendar[Date], "mmm")
  3. Year = YEAR(dCalendar[Date])
- 2) Sort Month Field by Month Number using the Sort By Column button.

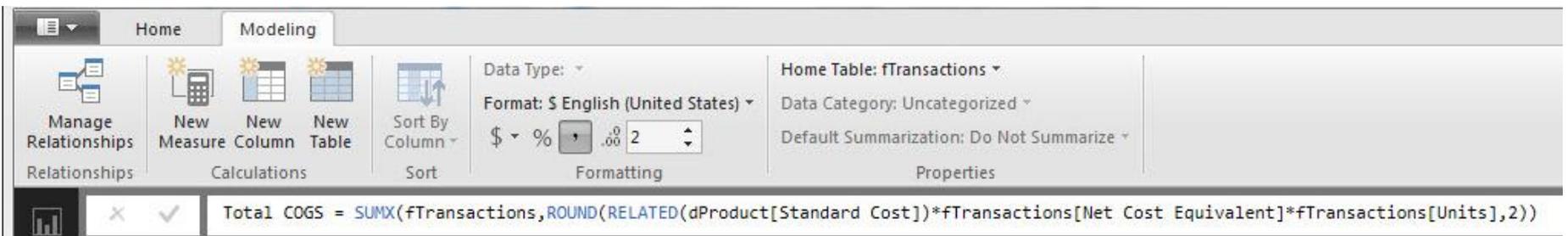


- 3) Go to the fTransaction table. Make sure it is selected.
- 4) Select the fTransactions Table. Then from the Modeling Tab, click New Measure and then create Measures for Total Revenue, Total COGS and Total Gross Profit (same as last video). The assignment operator is an equal sign for both the Calculated Columns and Measures.

5) Total Revenue formula:



6) Total COGS formula:



7) Gross Profit formula:

The screenshot shows the Power BI Modeling ribbon with the following sections:

- Relationships:** Manage Relationships
- Calculations:** New Measure, New Column, New Table
- Sort:** Sort By Column
- Formatting:** Data Type, Format: \$ English (United States), Currency symbol (\$), Percentage (%), Decimal places (.00), and Precision (2)
- Properties:** Home Table: fTransactions, Data Category: Uncategorized, Default Summarization: Do Not Summarize

The formula bar shows: `Gross Profit = [Total Revenue]-[Total COGS]`

Date	Product	Revenue Discount	Net Cost Equivalent	County Code	Units
Saturday, March 15, 2014	Fun Fly	0	0.86	USA	2

1.

8) The Table now looks like this:

The screenshot shows the 'fTransactions' table in the Power BI model view. The table contains the following fields:

- Date
- Product
- Revenue Discount
- Net Cost Equivalent
- County Code
- Units
- Total Revenue
- Total COGS
- Gross Profit

1.

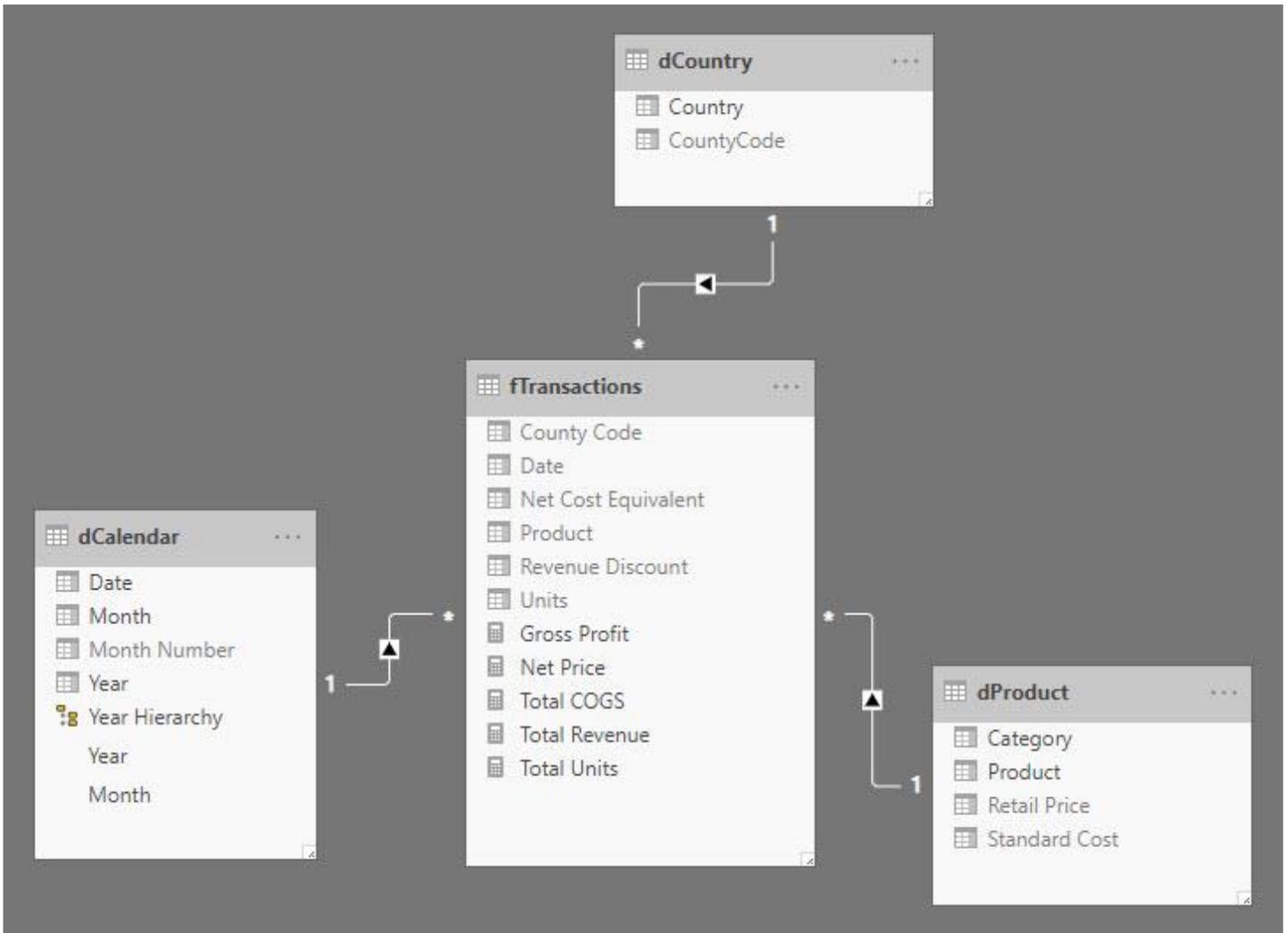
• Step 4: Hide Tables and Fields that are not used in Reports and Visualizations

The screenshot shows the 'dCountry' table in the Power BI model view. A context menu is open over the 'CountryCode' field, showing the following options:

- New Measure
- New Column
- Rename
- Delete
- Hide in Report View

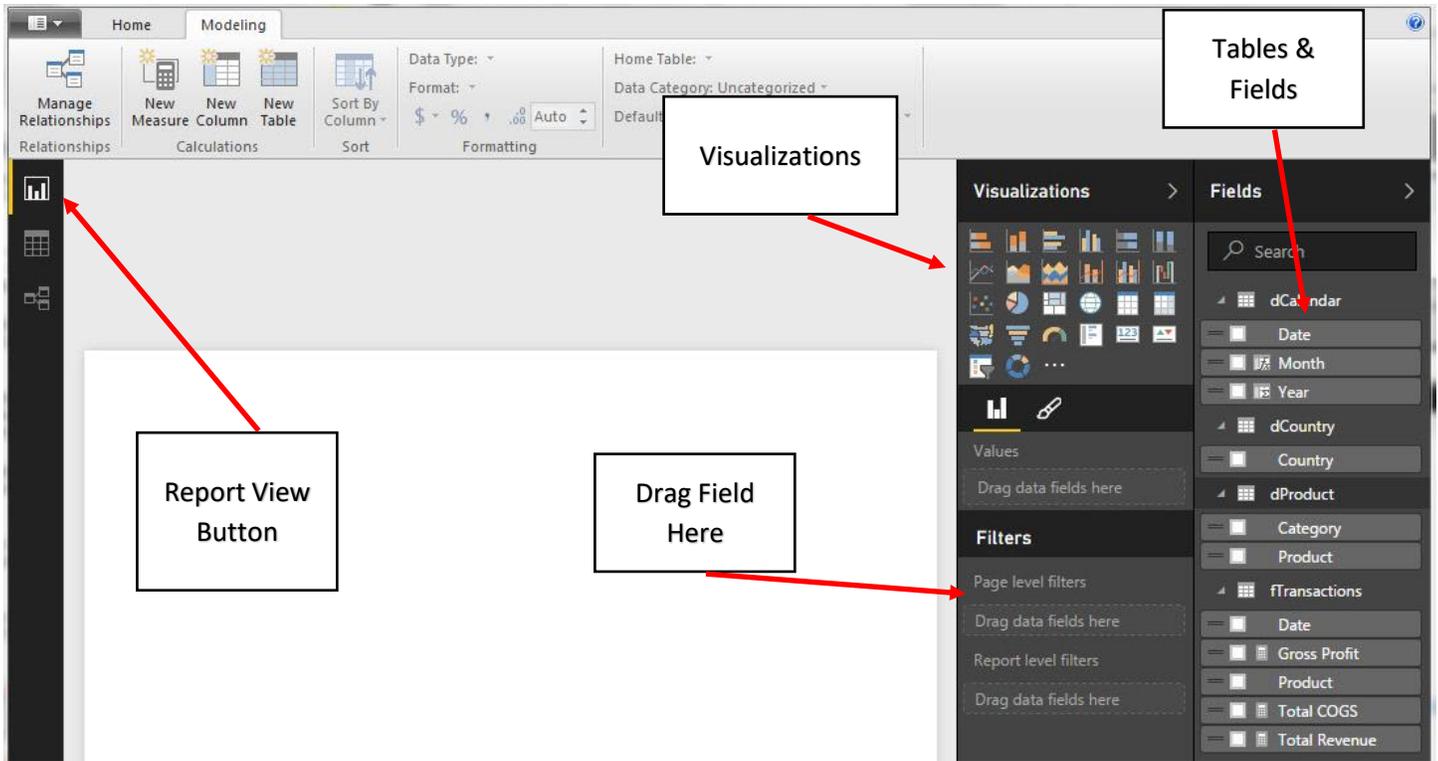
1.

Finished Data Model looks like this:



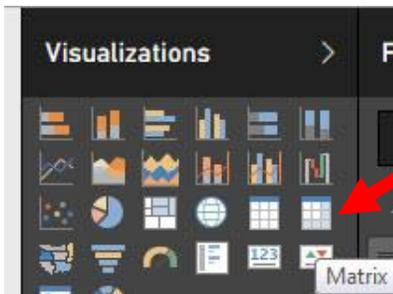
- Step 5: Create Reports and Visualizations

1) Click on Report View.

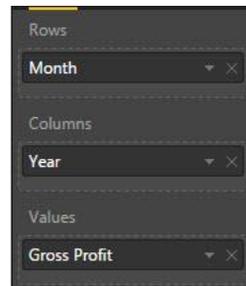


1.

2) In the Visualization area, click Matrix:



3) Drag Fields to Row, Column and Value areas, like:



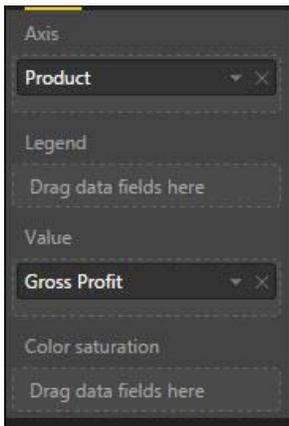
4) Matrix is really a Cross Tabulated Report (just like a PivotTable):

Month	2014	2015	2016	2017	2018	Total
Jan	\$3,819,934.48	\$2,940,163.85	\$2,946,949.85	\$3,105,701.47	\$3,457,254.87	\$16,270,004.52
Feb	\$3,462,427.50	\$2,642,332.13	\$2,727,644.32	\$2,823,563.35	\$3,077,759.31	\$14,733,726.61
Mar	\$3,812,849.72	\$2,936,235.71	\$2,914,122.05	\$3,139,866.31	\$3,398,848.24	\$16,201,922.03
Apr	\$3,700,766.60	\$2,880,375.79	\$2,839,063.00	\$3,037,409.14	\$3,304,950.38	\$15,762,564.91
May	\$3,870,594.57	\$2,915,313.61	\$2,979,399.46	\$3,081,124.31	\$3,395,053.73	\$16,241,485.68
Jun	\$3,702,897.60	\$2,850,490.89	\$2,834,135.23	\$3,001,765.92	\$3,255,337.88	\$15,644,627.52
Jul	\$3,906,380.55	\$2,930,938.14	\$2,956,157.04	\$3,078,284.69	\$3,377,164.18	\$16,248,924.60
Aug	\$3,845,931.77	\$2,901,416.56	\$2,958,017.16	\$3,088,589.69	\$3,400,877.05	\$16,194,832.23
Sep	\$3,760,355.19	\$2,805,607.99	\$2,871,190.52	\$3,007,166.01	\$3,331,085.84	\$15,775,405.55
Oct	\$3,774,079.80	\$2,923,778.29	\$2,965,419.68	\$3,124,030.41	\$3,449,790.89	\$16,237,099.07
Nov	\$7,726,558.00	\$6,580,164.93	\$6,879,830.89	\$7,981,931.47	\$9,848,292.19	\$39,016,777.48
Dec	\$14,999,566.40	\$10,696,836.32	\$10,533,006.06	\$10,393,263.01	\$10,216,640.10	\$56,839,311.89
<b>Total</b>	<b>\$60,382,342.18</b>	<b>\$46,003,654.21</b>	<b>\$46,404,935.26</b>	<b>\$48,862,695.78</b>	<b>\$53,513,054.66</b>	<b>\$255,166,682.09</b>

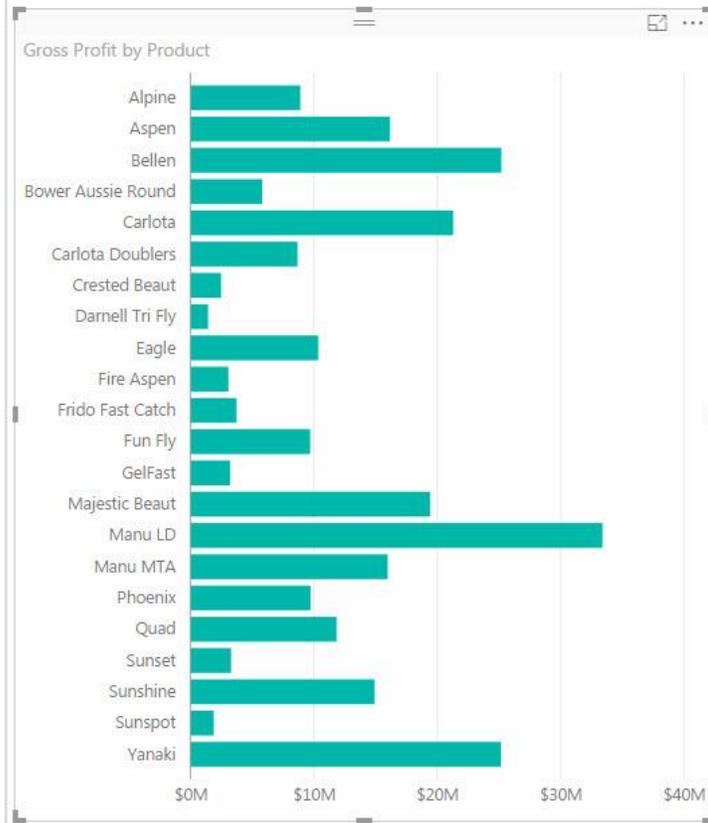
5) In the Visualization area, click Clustered Bar:



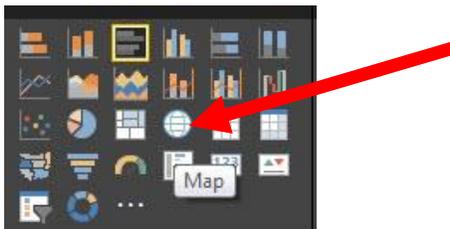
7) Drag Fields to Row, Column and Value areas, like:



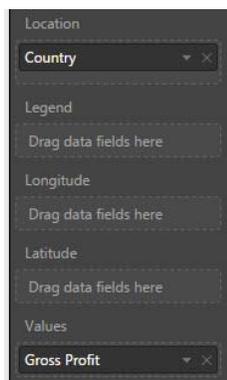
6) Chart:



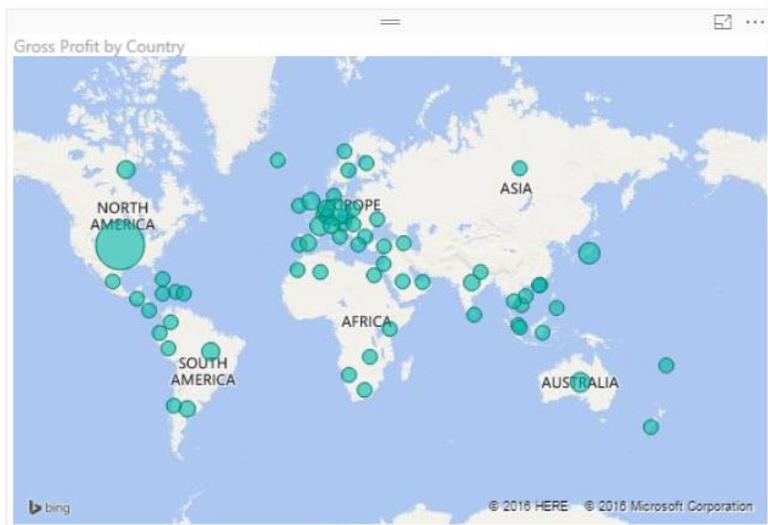
8) In the Visualization area, click Map:



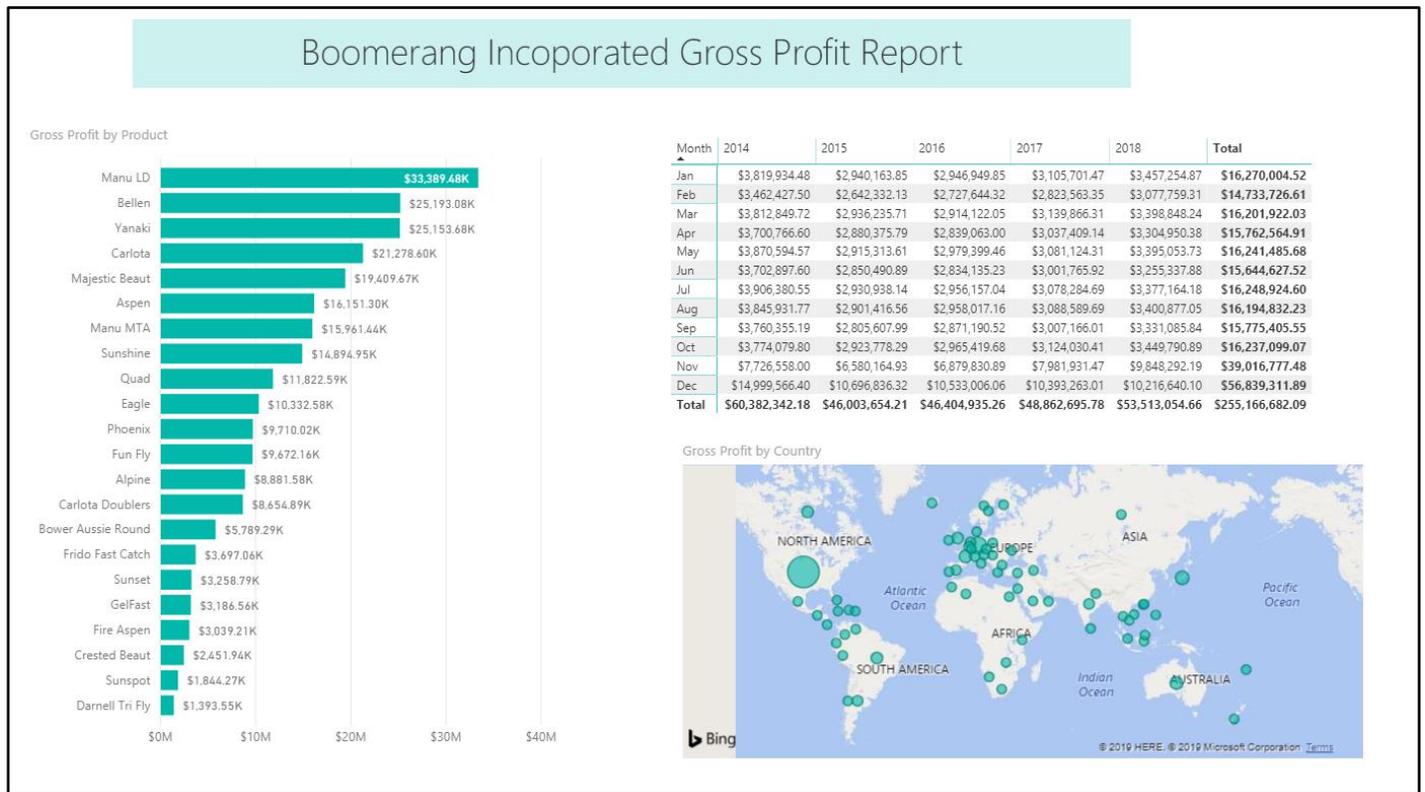
10) Drag Fields to Row, Column and Value areas, like:



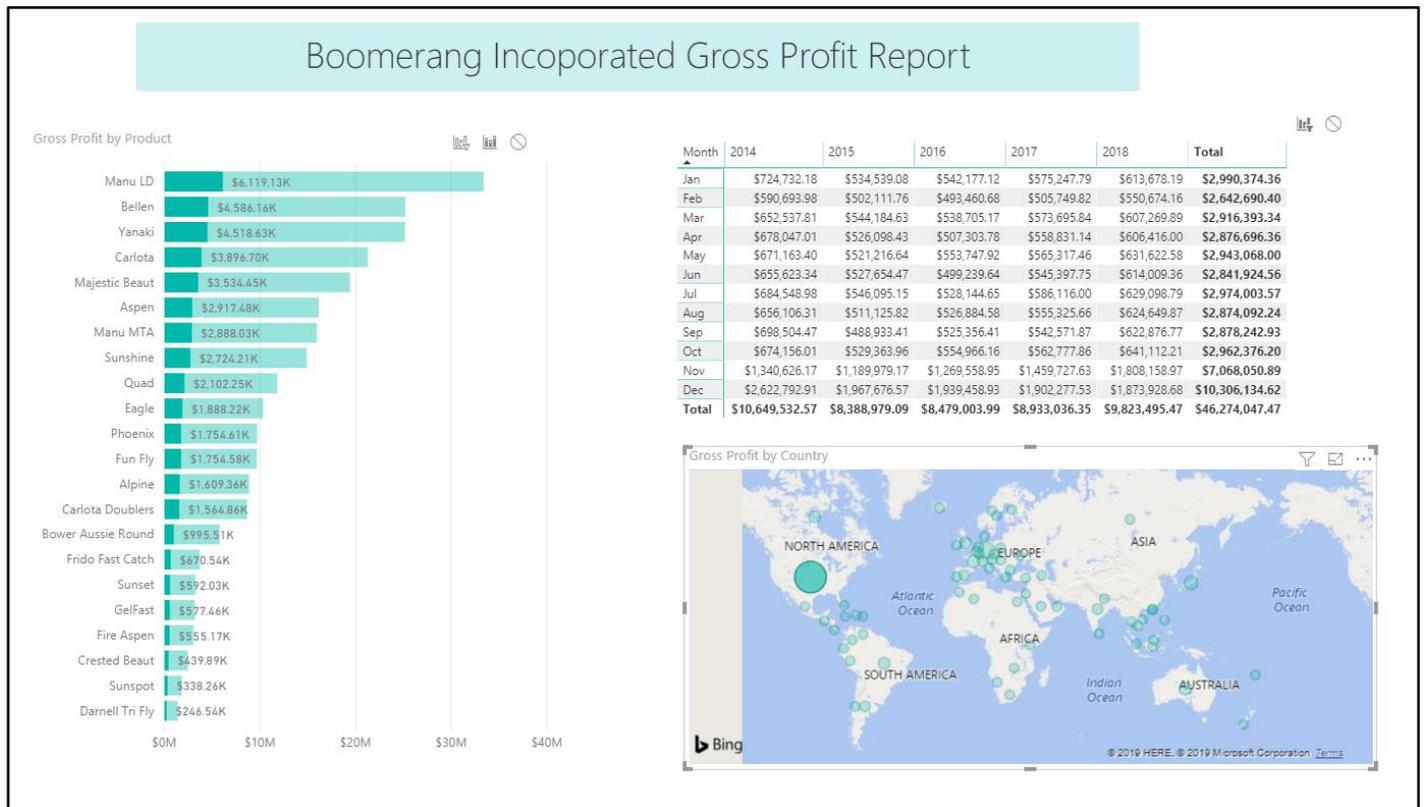
9) Map:



11) Finished Visualization:



12) Click an element (like United States):



### 13) Finished Unit Line Chart Visualization:

